and the rocking direction of the lever handle and the amount of rotation and the direction of rotation, driving of the actuator is controlled.

[0013] When both the amount of rocking and rocking direction of the lever handle for the support and the amount of rotation and direction of rotation of the lever handle for the support are detected by the detection means as described above, as well as on the basis of an output signal from the detection means corresponding to the amount of rocking and rocking direction of the lever handle and the amount of rotation and direction of rotation, the driving of the actuator is controlled, it is possible, by operating one lever handle, to obtain a control signal of an unit to be operated corresponding to the amount of rocking and rocking direction of the lever handle and a control signal of the unit to be operated corresponding to the amount of rotation and direction of rotation of the lever handle. Therefore, it is possible to provide multifunction to the haptic input apparatus with an operating feeling imparting function equipped with a lever handle.

[0014] In order to solve the problem, there is provided a haptic input apparatus according to the present invention, constructed such that between the support and the lever handle, there is provided an elastic member for automatically returning the lever handle to the center position set in the support.

[0015] If between the support and the lever handle, there is provided an elastic member for returning to the center as described above, the lever handle can be automatically returned to the center position by means of the elastic force of the elastic member when the operator moves his hands off the lever handle. Therefore, it is possible to obtain a haptic input apparatus with a center returning function in a simple structure.

[0016] In order to solve the problem, there is provided a haptic input apparatus according to the present invention, constructed such that as the actuator, there is used an electromagnetic brake.

[0017] When as the actuator, there is used an electromagnetic brake as described above, an external force can be directly applied to the lever handle only by arranging an electromagnetic coil opposite to the end surface of the lever handle with ferromagnetism imparted. Therefore, it is possible to simplify the structure of the haptic input apparatus with an operating feeling imparting function equipped with a lever handle, and to miniaturize this sort of haptic input apparatus at low cost.

[0018] In order to solve the problem, there is provided a haptic input apparatus according to the present invention, constructed such that as the actuator, there is used an off-brake type electromagnetic brake for applying an external force to the lever handle during non-energization.

[0019] When there is used an off-brake type electromagnetic brake in which an external force is applied to the lever handle during non-energization as described above, it is possible to reduce the power consumption of the haptic input apparatus because the electromagnetic brake can be energized only when the lever handle is operated.

[0020] In order to solve the problem, there is provided a haptic input apparatus according to the present invention, constructed such that as the detection means, there is used a non-contact type optical position sensor for irradiating the end surface of the lever handle with detection light to detect reflected light from the end surface of the lever handle, and for detecting an operating position and an operating direction of the lever handle, and that the non-contact type optical position sensor is arranged opposite to the end surface of the lever handle.

[0021] When as detection means for detecting the amount of rocking and rocking direction of the lever handle and the amount of rotation and direction of rotation, the non-contact type optical position sensor is used as described above, a mechanism for converting the rocking motion of the lever handle into the rotary motion or linear motion is not required as in the case where an encoder or a variable resistor is used. Therefore, the structure of the haptic input apparatus with an operating feeling imparting function equipped with a lever handle can be further simplified.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] **FIG. 1** is a structural view showing a haptic input apparatus according to a first embodiment;

[0023] **FIG. 2** is a waveform view exemplifying an external force to be applied to a lever handle of the haptic input apparatus according to the first embodiment;

[0024] **FIG. 3** is a structural view showing a haptic input apparatus according to a second embodiment;

[0025] **FIG. 4** is a structural view showing a haptic input apparatus according to a third embodiment; and

[0026] **FIG. 5** is a structural view showing a haptic input apparatus according to the prior art;

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0027] Hereinafter, with reference to **FIGS. 1 and 2**, the description will be made of a first embodiment of a haptic input apparatus according to the present invention. **FIG. 1** is a structural view showing a haptic input apparatus according to the first embodiment, and **FIG. 2** is a waveform view exemplifying an external force to be applied to the lever handle.

[0028] As shown in **FIG. 1, a** haptic input apparatus according to the present embodiment includes: a supporting member **2** having a spherical bearing **1**; a lever handle **4** having a spherical portion **3** to be supported by the spherical bearing **1**; an electromagnetic coil **5** arranged opposite to the lower end surface of the lever handle **4**; detection means **6** for detecting an operating state of the lever handle **4**; and control means **7** for taking in an output signal a from the detection means **6** to output a driving signal b of the electromagnetic coil **5** based on the output signal a. When this haptic input apparatus is applied as remote control for an automotive steering system or a gear shift unit or various kinds of electric equipment mounted on the automobile, the supporting member **2** is set up inside a panel **8** constituting an automotive dash board, console box and the like, and a grasp portion **9** formed in the upper part of the lever handle **4** is set up outside of the panel **8**.

[0029] The spherical portion **3** is formed in the substantially central portion of the lever handle **4**, and the spherical